

# Delayed Presentation of Huge Pseudoaneurysm of Profunda Femoris Artery Branch after Dynamic Hip Screw Fixation for Intertrochanteric Fracture: A Case Report and Literature Review

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Pseudoaneurysm is a rare life-threatening condition caused by vascular injury after a proximal femoral fracture fixation. Although the onset of symptoms may be acute or delayed, this condition requires early diagnosis and proper treatment. In cases with delayed presentation as soft tissue mass in the thigh area with or without pain and anemia, the differential diagnoses as soft tissue tumors, deep vein thrombosis, and infection should be considered. The definitive diagnosis can be set using duplex ultrasonography, CT angiography, and MRI. The management includes the conservative method and surgical treatment, depending on the lesion size. In the present report, the authors presented an elderly male who had delayed presentation of a huge pseudoaneurysm from the branch of his profunda femoris artery after proximal femoral fracture fixation, together with a literature review of its etiology, treatment, and outcome. The authors believed this article provide supportive information for an appropriate stepwise approach for diagnosis and an effective strategic management in the patients with pseudoaneurysm and having late presentation.

**Keywords:** Vascular complication, Hip fracture, Late presentation, Pseudoaneurysm

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Intertrochanteric fracture, one of the most common geriatric fractures, is associated with a high rate of mortality and complication<sup>(1,2)</sup>. Regarding the post-operative surgical-related complication, vascular injury with pseudoaneurysm formation after hip fracture (HF) fixation is an uncommon complication with an incidence of 0.2% after the internal fixation of an intertrochanteric fracture<sup>(3)</sup>. It was firstly reported in 1964<sup>(4)</sup> and described as an iatrogenic disruption in arterial wall continuity, where, under

the influence of sustained arterial pressure, blood dissects into the tissues around the damaged artery and forms a perfused sac that communicates with the arterial lumen. The perfused sac is contained by the media or adventitia, or simply by soft tissue structures surrounding the injured vessel<sup>(5)</sup>. Pseudoaneurysm after HF fixation is considered as a life-threatening condition due to the very high risk of unrecognized and significant internal bleeding resulting in subsequent hemorrhagic shock and death<sup>(6,7)</sup>. The common clinical presentations of pseudoaneurysm are mass or swelling of thigh, pain, and anemia. However, the onset of symptoms varies from several days to several months. Although most reports showed pseudoaneurysms in an early post-operative period (within a few months after HF fixation)<sup>(8)</sup>, cases with delayed presentation, after three months,

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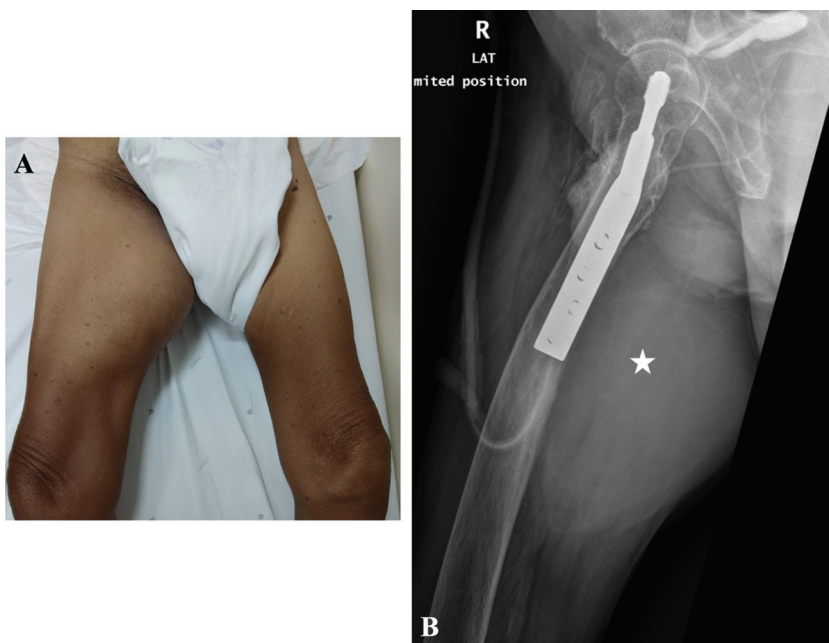
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**Figure 1.** Illustration of 72-year-old man presenting with a soft tissue mass diameter 20×15 cm at anteromedial aspect of the right proximal thigh in front view (A). Lateral radiograph of the right hip reveals a union of the proximal femur and a large soft tissue mass in the medial side of the proximal thigh (white star) without calcification (B).

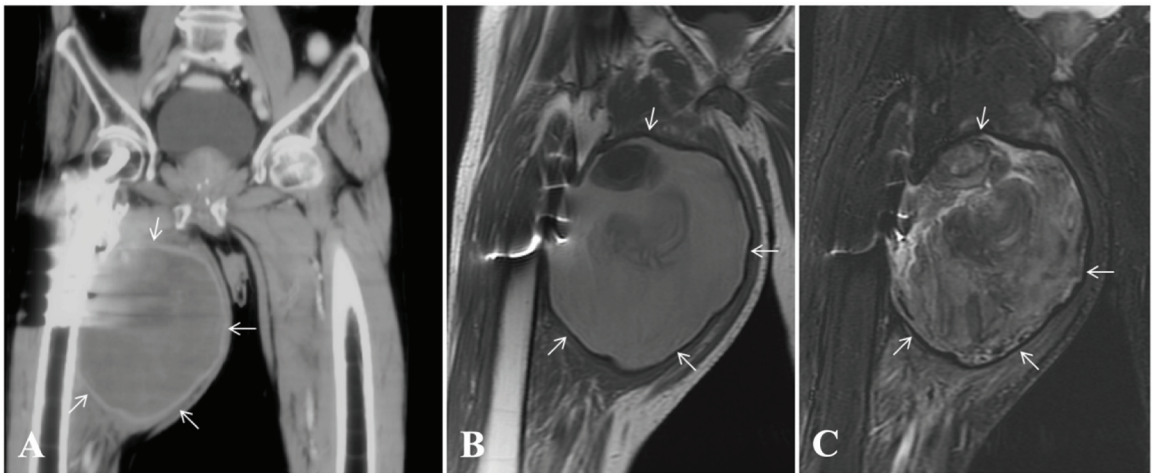
were still reported. To the authors' knowledge, the diagnosis of pseudoaneurysms with late presentation was commonly missed and resulted in a delay of case management. Therefore, the aim of the present study was to present an interesting case of an elderly patient who had large pseudoaneurysm of the profunda femoris artery (PFA) branch after dynamic hip screw (DHS) fixation and presented two years post-operatively. This is presented with a literature review of the case reports of pseudoaneurysm with delayed presentation of more than three months after fracture fixation.

### Case Report

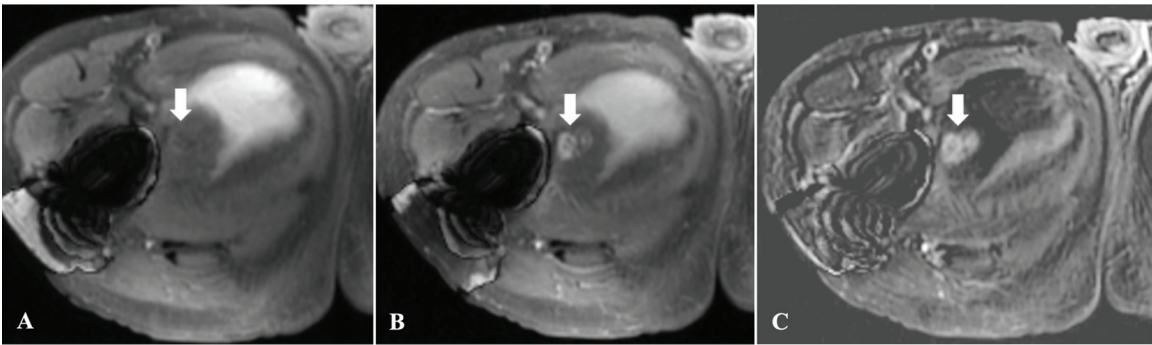
A 72-year-old male presented to the outpatient department at Ramathibodi Hospital due to a progressive enlarged mass on his right thigh for six months. He had history of intertrochanteric fracture of the right femur and underwent DHS fixation at another hospital two years earlier. The mass was located on the medial side of his right thigh and slowly became larger without pain or other symptoms, such as fever, weight loss, numbness, or weakness. He was referred to our hospital due to suspicion of a soft tissue tumor.

Physical examination revealed a large, well-circumscribed mass 20×10 cm in size with mild

tenderness and soft consistency on the anteromedial side of the right thigh without an audible bruit (Figure 1A). The distal pulses (dorsalis pedis and posterior tibial arteries) were intact, and the distal neurological findings were all normal. The old surgical scar was located on the lateral aspect of the proximal thigh without sign of inflammation. The initial right hip radiographs showed union of intertrochanteric fracture with remarkable DHS implant position and a large soft tissue mass in the proximal thigh. Neither implant loosening nor osteolytic lesion was found (Figure 1B). A computed tomography (CT) with contrast demonstrated a large cystic lesion on the medial side of the right femur (Figure 2A). A magnetic resonance imaging (MRI) with contrast confirmed a large pseudoaneurysm containing a multistage blood component, measuring 20.6×13.9×11.2 cm in dimensions, and located close to the proximal femur (Figure 2B, 2C, and 3). According to these results, the provisional diagnosis would be pseudoaneurysm after DHS fixation. Laboratory investigations revealed hemoglobin (Hb) of 14.1 g/dL, fasting blood sugar of 86 mg/dL, blood urea nitrogen of 10 mg/dL, serum creatinine of 0.98 mg/dL, normal serum electrolytes, and normal coagulation profile. The intraoperative femoral angiogram showed a pseudoaneurysm from a branch



**Figure 2.** Contrast-enhanced coronal-reconstructed MDCT image (A) reveals that the soft tissue mass in plain radiograph is a cystic lesion with its lateral part close to the surgical bed (white arrows). Coronal MR images in T1WI (B) and STIR sequence (C) reveal a lesion containing a multistage blood component, suggesting a bleeding hematoma (white arrows).



**Figure 3.** Axial MR images in fat-suppressed T1WI (A), fat-suppressed T1WI after intravenous contrast administration (B), and subtraction image (C) reveal an elliptical-shaped enhancing focus (thick white arrow) representing leakage of blood into a pseudoaneurysm.

of the deep femoral artery (Figure 4). Therefore, the vascular surgeon (Pootracool P) performed an open hematoma removal and endoaneurysmorrhaphy. The operative time and blood loss were 175 minutes and 2,000 mL, respectively. No peri-operative complications were found, and the length of hospital stay was four days.

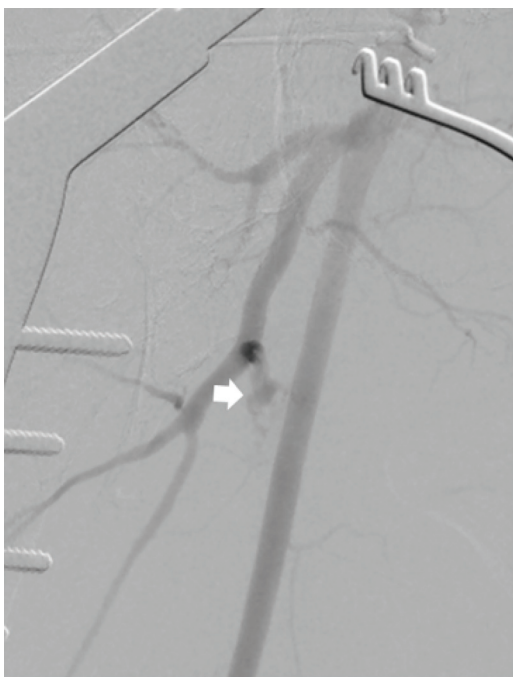
Nonetheless, three weeks post-operatively, the patient experienced high-grade fever, severe pain, and recurrent swelling on the previous pseudoaneurysm site. Ultrasonography showed a large fluid collection. He was diagnosed with an infected hematoma and treated with open drainage followed by percutaneous catheter drainage due to unresolved fluid collection. The wound culture was positive for extended-spectrum beta-lactamase-positive *Escherichia coli*. Therefore, intravenous antibiotics were given for six

weeks. At six months post-operatively, he returned to normal status without complication, and the ultrasound demonstrated no fluid collection. Due to the infection, implant removal was advised. However, the patient denied further surgery.

Patient has given informed consent for data allowance and publication. The present study has been reviewed and approved by the Institutional Review Board at Mahidol University, based on the Declaration of Helsinki (COA no. MURA2018/622, Protocol number 08-61-65).

### Discussion

The present report aimed to describe an interesting case with pseudoaneurysm that had delayed presentation at two years post-operatively and to provide a literature review regarding the



**Figure 4.** Femoral angiogram discloses a pseudoaneurysm (thick white arrow) from a branch of the profunda femoris artery.

clinical presentation of those with late presentation, location of pseudoaneurysm lesions, possible etiology, treatment, and postoperative outcomes.

From the literature review, the authors found nine reports of pseudoaneurysm after intertrochanteric fracture fixation with a presentation delayed by more than three months, as shown in Table 1<sup>(5,9-16)</sup>. With the inclusion of the present patient, the present report included 10 cases (n=10). The implants used were DHS in six cases (60%) and proximal femoral nail (PFN) in four cases (40%). The median time of presentation was 6.5 months (range 3 to 24 months). The clinical presentations were mass (100%), pain (60%), and weakness from femoral nerve compressive neuropathy (10%). However, none of the patients had anemic symptoms (0%). All vascular lesions were from the PFA or its branch (100%). This factor can be explained by the fact that the PFA and its branch locate near the medial cortex of the proximal femur, resulting in high risk for injury by bony spike fragment, drill bit, depth gauge, or tip of screw during fixation<sup>(17,18)</sup>. However, the possible etiology in these late-presented cases were often unknown (50%). That being stated, in these late-presented cases, we found two excessive screw length, two over-drilling, and one displaced

**Table 1.** Literature review of the intertrochanteric fracture patients who had pseudoaneurysm and delayed presentation more than 3 months after fracture fixation

Author (year)	No. of cases	Fixation	Onset (month)	Clinical presentation				Possible cause	Location	Treatments	Outcome
				Mass/swelling	Pain	Anemia	Weakness				
Maheshwari, et al. <sup>(9)</sup> (2004)	1	DHS	3	✓	-	-	-	n/a	PFA (br)	Embolization	Recovery but having proximal DVT complication
Dillon, et al. <sup>(10)</sup> (2004)	1	DHS	7	✓	✓	-	✓	n/a	PFA	Failed embolization then open surgical repair	Severe femoral neuropathy
Laohapoonrungrsee, et al. <sup>(11)</sup> (2005)	1	PFN	24	✓	✓	-	-	Excessive screw length	PFA	Embolization then open resection	Recovery
de Raaff, et al. <sup>(5)</sup> (2016)	1	PFN	5	✓	✓	-	-	LT fragment	PFA	Failed embolization then endovascular wallgraft stent	Death from suspected acute CHF
Toyota, et al. <sup>(12)</sup> (2017)	1	PFN	4	✓	✓	-	-	Excessive screw length	PFA (br)	Open resection	Recovery
Voorde, et al. <sup>(13)</sup> (2018)	1	PFN	8	✓	-	-	-	Over-drilling	PFA	Open drainage and arterial suture	Recovery
Pandey, et al. <sup>(14)</sup> (2018)	1	DHS	6	✓	✓	-	-	n/a	PFA (br)	Embolization	Recovery
Lidder, et al. <sup>(15)</sup> (2019)	1	DHS	15	✓	✓	-	-	Over-drilling	PFA (br)	Embolization	Recovery
Miladi, et al. <sup>(16)</sup> (2019)	1	DHS	3	✓	-	-	-	n/a	PFA	Open resection	n/a
The present study	1	DHS	24	✓	-	-	-	n/a	PFA (br)	Open surgical repair with endoaneurysmorrhaphy	Infected hematoma

DHS=dynamic hip screw; PFN=proximal femoral nail; n/a=not available; LT=lesser trochanter; PFA=profunda femoris artery; PFA (br)=profunda femoris artery branch; DVT=deep vein thrombosis; CHF=congestive heart failure

lesser trochanter fragment. In these late-presented cases, when the etiology is known, it is similar to the etiology for those who had clinical presentation in the early post-operative period<sup>(19,20)</sup>. Nonetheless, the awareness during surgical procedures, anatomical knowledge, and meticulous surgical skills, such as the concentration on drilling sound during fixation and perception of the safe zone for drilling during DHS fixation, are still necessary to prevent this complication<sup>(20,21)</sup>. Mahmoud et al<sup>(20)</sup> demonstrated the risk for arterial injury in DHS fixation as corresponding to the third and fourth screw holes on the shaft of the DHS side plate, while Gong et al<sup>(18)</sup> and Han et al<sup>(22)</sup> showed that the short PFN (170 and 200 mm in length) had higher risk for arterial injury than the long PFN.

Regarding the treatment in the pseudoaneurysm with delayed presentation, the outcome after treatment was reported in the nine case reports included in the present study. The mortality and morbidity rates are 11% (n=1) and 44% (n=4; one deep vein thrombosis, one severe femoral nerve neuropathy, one suspected acute congestive heart failure, and one infected hematoma), respectively. The embolization with either coil or thrombin was used in six cases but resulted in a 33% failure rate (n=2). The open vascular repair or resection was used in four cases without the need for reoperation. However, the patient in the present study had the complication of infected hematoma, which was successfully treated with sequentially open and percutaneous catheter drainage together with intravenous antibiotics (Table 1).

Based on the authors' findings, pseudoaneurysms with delayed presentation are commonly presented with mass and pain, and rarely presented with anemia or neuropathy. Therefore, the authors recommend prompt investigation with imaging modalities—such as ultrasound, CT, MRI, or angiography—for diagnosing pseudoaneurysm in the patients with delayed presentations more than months and history of intertrochanteric fracture fixation within two years. Regarding to the usefulness of the diagnostic modalities, ultrasonography could be used as an initial modality to evaluate the nature of mass or swelling due to its non-invasiveness<sup>(23)</sup>. CT angiography was the most frequently used modality for confirmation and localization of the injury with high sensitivity (90% to 95%) and specificity (98% to 100%)<sup>(24)</sup>. Treatment decision of pseudoaneurysm must be individualized for a given patient. In those with high surgical risk, the definitive treatment with endovascular embolization should be carefully performed by well-trained and

experienced interventional radiologists. Although open surgical repair was a more invasive procedure, it also had some benefits, including a high success rate, sudden elimination of the pseudoaneurysm, as well as the ability to identify and correct the cause of the pseudoaneurysm<sup>(23)</sup>. However, the risk of its complications, such as soft tissue complications and infection, should be discussed with the patients.

## Conclusion

Pseudoaneurysm is a rare vascular complication after HF fixation but still continually being reported in orthopedic clinical practice. Although most pseudoaneurysms occur in the early post-operative period, those with delayed presentation of up to two years are still possible. To prevent missed diagnosis and avoid this complication, the authors recommend raising the orthopedic surgeon awareness of this rare complication, using appropriate imaging modality to correctly diagnose, and being meticulous in pre-operative planning. Open surgical repair or resection is a standard and acceptable treatment option with a substantial risk of wound complication. In elderly patients with high surgical risk, endovascular embolization should be considered due to its minimal invasiveness. However, this alternative option also carries a significant risk of failure rate.

## What is already known on this topic?

Pseudoaneurysm after proximal femoral fracture fixation is a rare post-operative vascular complication. Most of them occur in the early post-operative period and require early diagnosis and proper treatment.

## What this study adds?

The authors report an uncommon case of a huge pseudoaneurysm with delayed presentation of up to two years post-operatively that was successfully managed with open surgical repair. Moreover, the authors have reviewed the literature of those who had delayed presentation and summarized the clinical presentation, vascular injury location and its etiology, treatment, and post-operative outcomes.

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## Conflicts of interest

The authors declare no conflict of interest.

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